CLAIMS

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is as follows:

1. A composite material, comprising:
at least 50 wt% graphite particles;
thermoplastic at 10 to 50 wt%; and
reinforcing fibers at 5 to 15 wt%,
wherein the bulk conductivity is at least 150 S/cm.

2. The composite material of claim 1 wherein the bulk conductivity is at least 200 S/cm.

3. The composite material of claim 1 wherein said composite material is formed in the shape of a bipolar plate.

4. The composite material of claim 3 wherein said bipolar plate has features molded into at least one surface.

5. The composite material of claim 1 wherein the tensile strength is at least 30 MPa.

6. The composite material of claim 1 wherein the flexural strength is at least 45 MPa.

7. The composite material of claim 1 wherein the thermoplastic includes more than one polymeric material.

8. The composite material of claim 7 wherein a first polymer is present in

a core of said composite material, and a second polymer, different from said first polymer, is present on a surface of said core.

9. The composite material of claim 8 wherein said first polymer is polyethylene terephthalate, and said second polymer is polyvinyldifluoride.

10. A method of manufacturing fuel cell bipolar plates, comprising the steps of:

forming a composite material comprising graphite particles, thermoplastic polymer, and reinforcing fibers, wherein the bulk conductivity is at least 150 S/cm; and

molding said composite material to form bipolar plates.

11 The method of claim 10 wherein said molding step is performed by compression molding.

12. The method of claim 10 wherein said forming step includes the steps of:

forming a plurality of sheets from graphite particles, thermoplastic fibers and reinforcing fibers using a wet-lay process;

consolidating a stack of said plurality of sheets;

obtaining a blank from a consolidated stack, wherein said blank is used in said molding step.

13. The method of claim 10 wherein said reinforcing fibers are selected from the group consisting of carbon and glass.

14. The method of claim 10 wherein said molding step introduces at least one feature into said bipolar plates.

15. The method of claim 14 wherein said at least one feature is a gas flow channel.

16. The method of claim 10 wherein said forming step includes the steps of:

forming a plurality of formable sheets by a wet lay process; and

stacking said plurality of sheets in a mold.

17. The method of claim 16 further comprising depositing a second polymer different from said thermoplastic polymer on a top and bottom of said stack.

18. The method of claim 16 further comprising adding graphite particles to said stack.

19. The method of claim 10 wherein said forming and molding step occur simulteanously or sequentially.

20. The method of claim 10 wherein said composite material produced in said forming step includes a first polymer in a core of said composite material and a second polymer, different from said first polymer, on a surface of said core.